REMARKS

This communication is a full and timely response to the Office Action dated January 7, 2009. Claims 17-28 and 37-42 remain pending, where claims 1-16 and 29-32 were previously canceled. By this communication, claims 33-36 are canceled without prejudice or disclaimer of the underlying subject matter, claims 17-19 and 21-28 are amended, and claims 37-42 are newly added. Support for the amended subject matter can be found, for example, in Figure 1 and on page 5, line 1 through page 6, line 31 of the disclosure.

In numbered paragraph 1 on page 2 of the Office Action, claims 17-28 and 33-36 are rejected under 35 U.S.C. §103(a) as alleged being unpatentable over *Molyneux-Berry* (EP 0851238 A2) in view of *Rees et al* (U.S. Patent Publication No. 2004/0046689). Applicants respectfully traverse this rejection.

As discussed in the previous response, exemplary figures 1-9 illustrate various embodiments in which a coherent burst is emitted from a radar antenna and is reflected by objects in its path. The returns from the coherent bursts are split into two mutually orthogonal components, i.e., the in-phase (I) and quadrature (Q) components. A target helix, representing noise contamination for the return signal is imposed onto a clutter trajectory that is substantially parallel to a time axis. This helical model of the target return is fitted to the data sample from the returns. The fit to the sample data is optimized in the least squares fashion to minimize the error

value. The best fit target radial velocity is extracted from the helix and outputted.

Independent claim 17 broadly encompasses the features illustrated in Figures 1-9 of Applicants' disclosure by reciting the following:

> A method of extracting a radial velocity characteristic of a target from one or more coherent radiation pulse bursts comprising the steps of:
>
> (g) receiving radiation echo returns of the pulse bursts from a remote scene;
>
> (h) processing the echo returns into in-phase (I) and quadrature (Q) components;
>
> (i) measuring returns at intervals to provide sampled data;
>
> (j) applying a predetermined function to the I-Q returns;
>
> (k) modifying the predetermined function based on phase and amplitude to match the sampled data as a function of velocity;
>
> (l) determining the target radial velocity in dependence upon said modification step of the predetermined function, and
>
> (g) outputting the determined target radial velocity.

The combination of *Molyneux-Berry* and *Rees* fails to establish a *prima facie* case of obviousness with respect to the combination of features recited in Applicants' claims.

As discussed in a previous response, *Molyneux-Berry* discloses a system in which a receiver 5 supplies echo signals in video form to a moving target indicator (MTI) canceller and detector unit 6. The MTI canceller and detector unit subtracts echo signals due to stationary clutter and slow-moving targets before thresholding the residual video to obtain raw detections of targets of interest. The raw detecting data passes to a plot extractor unit 7. This unit stores and associates raw detection data

using algorithms that decide whether adjacent detections should be reported as separate targets or combined into a single detection report. Unreliable, implausible, or uninteresting detections may be rejected and the remaining "targets of interest" are reported as target plots in a data format and a coordinate system of the end user. The concept described in the *Molyneux-Berry* patent uses Doppler measurement algorithms to process a sequence of echoes returned by strikes on a target whose Doppler shift is being measured. See page 5, line 33 through page 6, line 18.

Independent claim 17 recites in part, <u>modelling the sampled data by applying a predetermined function</u>, **and** <u>modifying the predetermined function based on phase and target amplitude</u> to optimize the fit to the sampled data as a function of velocity.

In comparison, there is no attempt in *Molyneux-Berry* to model the sampled data by applying a predetermined function and then modifying the function, i.e. the model, based on both phase and target amplitude to optimize the fit of the model to the sampled data. *Molyneux-Berry* neither tries to model the data itself nor attempts to take both phase data and target amplitude into account in a single modelling and best fit process. Rather, the concept described in *Molyneux-Berry* simply finds a velocity value that best matches the actual sample data. This concept might use a pre-determined function in relating velocity to phase but it does not attempt to find a model of the sampled data itself. The modelling end modifying these features of the claimed embodiment enable the analysis

of sampled data containing both clutter and target echo returns "in one go", without pre-processing to get rid of the clutter echo returns. The claimed embodiment also allows both velocity and target amplitude information to be obtained from the one modelling process.

The Examiner refers to lines 7-15 on page 4 of *Molyneux-Berry* in relation to applying a predetermined function to I-Q returns and modifying the predetermined function to match the sampled data as a function of velocity. This passage of *Molyneux-Berry* discloses the following:

"Advantageously the Doppler extraction processor is arranged to retrieve from the stored data the relative phases of successive echoes from a target of interest: compare a range of velocity values with the received phase data; and identify the velocity value that best fits the phase data. (the range of velocity values is preferably limited to a plausible range for a particular target type.) The best fit can be found by calculating a fit error value for each velocity value in the range tested; the set of error values constituting an error function; prominent nulls in the error function are possible values of the target approach velocity. The approach velocity corresponding to the deepest null can then be assigned to a target of interest provided the null depth is below a predetermined threshold. To compare null depths more accurately the Doppler extraction processor may determine the best fit error values by using a finer range of velocity steps in the region of prominent nulls in the error function."

From this passage, one of ordinary skill would understand that *Molyneux-Berry* is looking only at phase values and only dealing with the

raw sampled data by finding a velocity that would produce the sampled data. It seems readily apparent that *Molyneux-Berry* is not attempting to model the sampled data itself. This process is perfectly acceptable in some circumstances and has an advantage because it uses much less processing power. However, it provides poor results in the presence of non-stationary clutter. This is where the curve fitting approach of the invention is preferable because although it has a much higher processing requirement, it produces much more, and more accurate data relating to both velocity and size of a target.

The Examiner acknowledges that the *Molyneux-Berry* patent fails to disclose or suggest modifying the predetermined function based on phase and amplitude. The *Rees* patent is applied in an effort to remedy this deficiency.

The *Rees* patent recognizes that there is non-target data in echo returns which is slow-changing between pulses, or between range cells for a given pulse, and this can be modelled and effectively removed or filtered out to enhance target detection. For example, the *Rees* patent discloses:

> "[0065] . . . . . .
> . . . . . thus we can take, for a given pulse, a predicted, modelled, averaged or otherwise smoothed or best-fitted, value for the phase noise for that given pulse based on the phase noise from different nearby range cells.
>
> [0066] Thus for a given pulse in a given range bin we can smooth phase noise by averaging/best-fitting detected phase difference to a line derived from the phase noise detected for that pulse in adjacent range cells. A close fit of the measured change of pulse predicted by smoothing (for each pulse separately) over nearby range cells is indicative that the detected phase noise for that pulse has no target contribution: wide derivation (sic) from the predicted value is indicative that there is a target in that range bin."

From the foregoing, one of ordinary skill would understand that the *Rees* patent does not attempt to model data representing target returns. Rather, modelling is only performed on slow-changing noise due to clutter or phase drift, so that a threshold can be applied to identify target returns that don't fit the model.

Stated differently, the concept described in this patent appears to only provide for modelling a selection of data from the sampled data: the non-target data. Although this concept possibly be used to modify a pre-determined function to achieve an improved fit to the slow-changing non-target data, this result cannot be achieved based on phase and target amplitude because the model specifically excludes the target data. Lastly, the *Rees* patent does not appear to contemplate determining the target radial velocity in dependence on the modified predetermined function. Rather, the described concept arguably only uses the function to filter target data from non-target data. The velocity is subsequently calculated, for example from the Doppler frequency, as described in paragraph [0103]:

> [0103] the filtered returns are transformed, typically using a convolution integral, into frequency space. The transform has an amplitude representative of the radar cross-section of an object in a given range cell and a frequency (Doppler bin) corresponding to the Doppler frequency of the object with respect to the receiver."

In summary, the *Molyneux-Berry* and *Rees* patents when applied individually or in combination as alleged by the Examiner fail to disclose or suggest every feature and/or the combination of features recited in

Applicants' claims. Accordingly, a prima facie case of obviousness has not been established.

For rejections under 35 U.S.C. § 103(a) based upon a combination of prior art elements, in KSR Int'l v. Teleflex Inc., 127 S.Ct. 1727, 1741, 82 USPQ2d 1385, 1396 (2007), the Supreme Court stated that "a patent composed of several elements is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art." "Rejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some **articulated reasoning with some rational underpinning** to support the legal conclusion of obviousness." In re Kahn, 441 F.3d 977, 988, 78 USPQ2d 1329, 1336 (Fed. Cir. 2006) (emphasis added). Based on the reasons discussed above, withdrawal of this rejection is respectfully requested.

Newly added claims 37-42 depend either directly or indirectly from independent claim 17. Applicants respectfully submit that these claims are allowable for the reasons discussed in detail above and are otherwise distinguishable over the applied patents because of the additional features recited therein. Favorable consideration and allowance of these claims is requested.

Conclusion

Based on the foregoing amendment and remarks, Applicants respectfully submit that claims 17-28 and 37-42 are allowable and this application is in condition for allowance. In the event any unresolved issues remain, the Examiner is invited to contact the undersigned.

Respectfully submitted,

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